REMARKS/ARGUMENTS

Favorable reconsideration of this application is requested in view of the above amendments and in light of the following remarks and discussion.

Claims 1-14 are pending in the application, Claims 1, 4 and 8 having been amended and Claims 9-14 having been added by the present amendment.

In the outstanding Office Action, Claims 1-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP 04-134815 (hereinafter "JP '815") in view of Beatty et al. (U.S. Patent 6,692,249); and Claims 1-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Beatty et al.

Claims 1, 4 and 8 have been amended pursuant to the telephone interview held with Examiner Lund on January 7, 2007, and Claims 9-14 have been newly added herein. These new claims are believed to find clear support in the specification, claims and drawings as originally filed, for example, page 9, line 23, to page 10, line 9, of the specification, and no new matter is believed to be added thereby. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory language.

Briefly recapitulating, Claim 1 according to the present invention is directed to an outer tube which has a body made of silicon carbide, configured to be used in a thermal treatment system and having an upper portion, a lower portion and a flange. The upper portion is closed, the lower portion is open and is formed with a tapered portion expanding toward a lower end of the body, the flange is formed on an outer peripheral side of the tapered portion of the lower portion, and the following conditions are met: 1) a ratio of t_a/D_1 is from 0.0067 to 0.025, 2) a product of $t_a \times D_1$ is from 600 to 4,000 (mm^2), 3) $(D_{F2}-D_{F1})\times t_c/(D_1 \times t_a)$ is from 0.1 to 0.7, and 4) L_1/L_2 is from 1 to 10, where the lower portion has a thickness of t_a (mm) and an inner diameter of D_1 (mm), the flange has a thickness of t_c (mm),

an inner diameter of D_{F1} (mm) and an outer diameter of D_{F2} (mm), and the tapered portion tapers such that the lower portion is expanded from the inner diameter D_1 to the inner diameter D_{F1} over a height L_1 (mm) and an expanse of L_2 (mm). By providing such a lower portion, the outer tube according to Claim 1 allows a larger size in its diameter and exhibits better durability and improved isothermal heating zone.[1]

The outstanding Office Action asserts that "it would have been obvious ... to make the outer tube of Shiozawa [*i.e.*, JP '815] out of silicon carbide as taught by Beatty et al, and to provide specific dimension from which to manufacture the apparatus of Shiozawa." However, it is respectfully submitted that in order to properly combine or modify references for the purpose of the obviousness rejection, *the references must suggest the desirability of a proposed combination or modification beyond the mere fact that references can be combined or modified.*[2] CAFC established that ***substantial evidence*** *of motivation or teaching must be shown for combining or modifying the references,*[3] and also that such modification requires "***clear and particular evidence.***"[4]

The external tube in JP '815 is made of quartz, *i.e.*, SiO_2, and since SiO_2 has a low thermal expansion coefficient and a low thermal conductivity, it does not involve technical

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[1] See, for example, Specification, page 4, lines 12-17.

[2] MPEP 2143.01, In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). See also MPEP 2144.08 III stating that "[e]xplicit findings on motivation or suggestion to select the claimed invention should also be articulated in order to support a 35 U.S.C. 103 ground of rejection .... Conclusory statements of similarity or motivation, without any articulated rational or evidentiary support, do not constitute sufficient factual findings."

[3] In re Gartside, 203 F3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000) (holding that, consistent with the Administrative Procedure Act at 5 USC 706(e), the CAFC reviews the Board's decisions based on factfindings, such as 35 U.S.C. § 103(a) rejections, using the 'substantial evidence' standard because these decisions are confined to the factual record compiled by the Board.).

[4] In re Dembiczak, 175 F3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999) ("We have noted that evidence of a suggestion, teaching, or motivation to combine/modify may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved, although 'the suggestion more often comes from the teachings of the pertinent references.' The range of sources available, however, does not diminish the requirement for actual evidence. That is, the showing must be clear and particular.") (emphasis added).

difficulties such as cracking. On the contrary, SiC has a high thermal expansion coefficient and a high thermal conductivity, thus making more susceptible to cracking. As such, a mere reference to the SiO_2 outer tube of JP '815 for its shape without any further considerations for structural dimensions as recited in Claim 1 would result in incapable of preventing cracking. Thus, it is believed that the outstanding obviousness rejection based on JP '815 and Beatty et al. is a product of hindsight guided by Applicants' disclosure and that the outer tube recited in Claim 1 cannot be rendered obvious over JP '815 in view of Beatty et al. Accordingly, Applicants respectfully request withdrawal of the outstanding obviousness rejection based on the proposed combination of JP '815 and Beatty et al.

Regarding the obviousness rejection based on Beatty et al., Applicants respectfully submit that Beatty et al. neither teaches nor suggests "a body made of silicon carbide ... and having ... a lower portion and a flange, wherein ... the lower portion is open and is formed with a tapered portion expanding toward a lower end of the body, the flange is formed on an outer peripheral side of the lower portion ...; where the lower portion has a thickness of t_a (mm) and an inner diameter of D_1 (mm), the flange has a thickness of t_c (mm), an inner diameter of D_{F1} (mm) and an outer diameter of D_{F2} (mm), and the tapered portion tapers such that the lower portion is expanded from the inner diameter D_1 to the inner diameter D_{F1} over a height L_1 (mm) and an expanse of L_2 (mm)" as recited in amended Claim 1. As presented in the previous response, the lower portion which includes the tapered portion has a thickness t_a, the tapered portion is expanding the inner diameter, and the flange is formed on an outer peripheral side of the lower portion. Thus, the tapered portion of the lower portion forms an angle of less than 90° (this angle is calculated to be around 45° to 84° when L_1/L_2 is from 1 to 10 as recited Claim 1.) in the inside with respect to the surface of the base and an angle of more than 90° on the outside (see Appendix A). On the other hand, the tube shown in Beatty et al. has a "tapered" portion which has a different thickness from the rest of the tube, *i.e.*, the

"tapered" portion of Beatty et al. is made thicker than the rest of the tube. As such, it is believed that excessive stress is exerted on the thicker portion of the Beatty et al. tube, making it less durable. Furthermore, the tube shown in Beatty et al. has the flange and "tapered" portion supporting the tube at the right angle, and thus more stress is believed to be concentrated toward the flange as shown in Figure 4, making it more likely to be broken. Therefore, it is respectfully submitted that the structure recited in amended Claim 1 is believed to be distinguishable from Beatty et al.

Claims 4 and 8 are believed to include subject matter substantially similar to what is recited in amended Claim 1 to the extent discussed above. Thus, Claims 4 and 8 are also distinguishable and patentable over JP '815 and Beatty et al. For the foregoing reasons, Claims 1, 4 and 8 are believed to be allowable. Furthermore, since Claims 2, 3, 5-7 and 9-14 ultimately depend from one of Claims 1, 4 and 8, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2, 3, 5-7 and 9-14 are believed to be allowable as well.

Applicants also wish to point out that the subject matter recited in Claim 2 is further distinguishable over JP '815 and Beatty et al. for the following discussions. Specifically, Claim 2 recites that the tapered portion has upper and lower edges of an inner peripheral side rounded with a radius of 2 mm (R2) or above. By constructing the outer tube as such, it is possible to avoid stress concentration.[5] For example, referring to Example 2, the upper and lower edges of an inner peripheral side of the tapered portion are formed rounded, and no crack occurred even after the deposition of a CVD film was repeated 40 times at 750°C. Without such a rounded portion, Example 1 shows no crack after the deposition of a CVD film was repeated 40 times at 550°C. Therefore, Applicants respectfully submit that the

[5] See Specification, page 10, lines 12 to 13.

subject matter recited in Claims 2 and 5 are further distinguishable over JP '815 and Beatty et al.

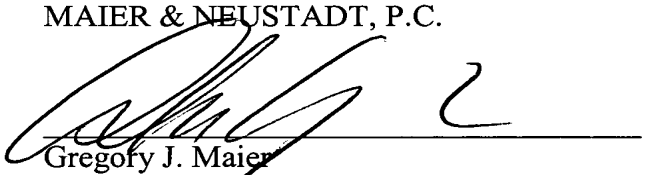
Applicants further wish to point out that the subject matters recited in Claims 9-14 are distinguishable over the JP '815 and Beatty et al. based on the following discussions. In each of Examples 1 and 2, the value of "$(D_{F2}-D_{F1}) \times t_c/(D_1 \times t_a)$" is set within a range of 0.1 to 0.7, and the value of Ll/L2 is set 4.3, thus satisfying the ranges recited in Claims 1, 4 and 8. When "$(D_{F2}-D_{F1}) \times t_c/(D_1 \times t_a)$" is set within the above-mentioned range, a higher mechanical strength is achieved[6] and the thermal stress is reduced.[7] When L_1/L_2 is set within a range of 1 to 10, the temperature gradient is reduced, contributing to the reduction of thermal stress.[8] On the contrary, in Comparative Examples 3 and 4, "$(D_{F2}-D_{F1}) \times t_c/(D_1 \times t_a)$" is set outside the range recited in Claims 1, 4 and 8, while Li/L2 is made equal to 1, *i.e.*, within the range recited in Claims 1 and 4. These Examples and Comparative Examples show a synergistic effect of $(D_{F2}-D_{F1}) \times t_c/(D_1 \times t_a)$ and L_1/L_2 for reducing the thermal stress and preventing cracking when they are set as recited in Claims 9-14. Hence, Applicants respectfully submit that the subject matters recited in Claims 9-14 are distinguishable over JP '815 and Beatty et al.

[6] See id., page 9, lines 3 to 8.
[7] See id., page 9, line 23 to page 10, line 9.
[8] See id., page 8, line 24 to page 9, line 6.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Gregory J. Maier
Attorney of Record
Registration No. 25,599

Akihiro Yamazaki
Registration No. 46,155

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)

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